

SYSTEM 20
TAIL WARNING DEVICE

INSTRUMENTATION

AND

FLIGHT TEST PLAN

September 1967

LIMITED DISTRIBUTION

NOFORN

SECRET

Approved For Release 1999/09/07 : CIA-RDP71B00263R000200320025-6

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REVISION SHEET

Paragraph Changed

Date

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## Approved For Release 1999/09/07 : CIA-RDP71B00968R000200320025-6

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- 1. SCOPE
- General: The purpose of the System 20 flight test series is to prove performance of that system and to obtain technical data under "near tactical conditions" which may be used to evaluate the performance of the system while operating in a tactical environment. In order to obtain useful data from these tests; it is necessary for the test bed to be configured as closely as possible to the operational vehicles.
- 2. TYPES OF TESTS
- 2. l. <u>Background flight tests</u>, including:
- 2.1.1. Airborne vehicles
- 2.1.2. Ground sources
- 2.1.3. Water sources
- 2.1.4. Solar source
- 2.2. Target detection flight tests, including:
- 2.2.1. F-104 interceptors
- 2.2.2. F-106 interceptors
- 2.2.3. F-4 interceptors
- 2.2.4. Other available jet aircraft
- 3. BACKGROUND FLIGHT TESTS
- 3.1. <u>Airborne vehicles</u>
- 3. 1. 1. Wide range of jet commercial and military aircraft.
  Afterburning and nonafterburning aircraft are required.
  During some portions of the test, controlled flight paths of cooperative target aircraft will be required.

3.2.	Ground and sea targets
3.2.1.	Flights over the ocean, over steel mills, etc., shall be required. The flight over the ocean shall take place in the afternoon or morning so the sun position can produce a worst case specular condition.
3.3.	Test duration
3.3.1. 2+1	Two (2) test bed flights will be required. One (1) back-up flight shall be scheduled and utilized if required.
3.4.	Detailed requirements (see Appendix A)
4.	TARGET DETECTION FLIGHT TESTS
4.1.	General: During this phase of the test effort, the interceptor shall perform intercepts in the manner normally encountered in the field. Other flight patterns are also required.
4.2.	Target requirement
4.2.1.	F-104
4.2.2.	F-106
4.2.3.	F-4
4.2.4.	Other readily available aircraft
4.3.	Test duration
4.3.1.	Test flights shall be scheduled on alternate days.
4.3.2.	Three (3) test bed flights are required. Each mission shall require approximately four (4) hours. One (1) back-up flight shall be scheduled.

Detailed requirements (see Appendix B)

	AVIONICS
5.	INSTRUMENTATION
5. 1.	Test bed instrumentation
5.1.1.	Motion picture photography
5. 1. 1. 1.	Photography shall use film optimized for target to background contrast.
5. 1. 1. 2.	Camera control shall be electrically controllable by System 20 or the pilot.
5. 1. 1. 3.	Event recording provision on film is required for date correlation purposes.
5. 1. 1. 4.	The field of view shall cover the System 20 envelope (* 40 degrees az., +15 through -30 degrees elevation
5. 1. 1. 5.	Frame rate
5. 1. 1. 5. 1.	A frame rate of one (1) frame per five (5) seconds is suggested during background test flights. During the background test flight series, the camera may be operated continuously.
5. 1. 1. 5. 2.	A frame rate of one (1) frame per two (2) seconds is suggested during the target detection test flights. Control of the camera will be by the pilot and/or System 20 command.
5. 1. 1. 6.	These provisions are required during all test flights.
5. 1. 2.	Voice recording
5.1.2.1.	Air/ground/air communications
5. 1. 2. 2.	Cockpit (pilot) commentary
5. 1. 2. 3.	Approximately one (1) hour of recording capacity is

needed.

5.1.2.4.	This provision is required during all test flights.
5.1.3.	System activity signal recording
5.1.3.1.	General - Recording of system activity can be made by either photographic, strip chart, or magnetic recording. A remote sector light and test light display may be installed in the Q-bay. (Strip chart recording is the most desirable method of instrumentation.)
5.1.3.2.	Twelve (12) sector signals
5.1.3.3.	Test light
5.1.3.4.	Press-to-test signal (switch)
5.1.3.5.	Time correlation - Time recording, for purposes of data reduction, is required.
5.1.3.6.	Pulse recording - 4 channels, minimum
5.1.3.7.	The recording device shall be electrically controlled by the pilot and/or System 20 if the recording media is not sufficient to allow for continuous operation over a period of four (4) hours.
5.1.3.8.	This provision is required during all test flights.
5.1.3.9.	Photographic camera intervalometer
5.1.3.10.	System 9B "BW" activation
5.1.4.	Audio warning: The test bed pilot shall announce the presence of the audio tone over the radio link (recorder in record all position).
5.1.5.	Aircraft position: During background measurement tests, the pilot shall either log or transmit his position at intervals not to exceed five minutes or when positioned over a target area. (It is assumed that a vectoring facility will not be utilized during the entire background test series.)

5.1.6.	Data reduction: Ground		
5.1.6.1.	Provisions for playing back magnetic recordings, if utilized for instrumentation, required for "quick look" data reduction. Provision for "slow motion" or single frame projection of photographic documentation is required.		
5.1.6.2.	Facilities for processing motion picture photography, in a maximum time period of eighteen (18) hours, shall be required for the interceptor and test bed photography.		
5.1.6.3.	The above is required to support all flight tests.		
5.1.7.	The test bed shall carry an AN/APN-35 beacon during target detection tests.		
5.1.8. 5.2. A DC.	Detailed technical information (see Appendix C and Appendix D).  Vectoring facility instrumentation		
5.2.1.	Time correlation: All data shall contain time information having one (1) second resolution (or better resolution if possible) and synced with WWV prior to each test series.		
5.2.2.	Test bed position (geo)		
5.2.3.	Interceptor(s) position(s) (geo)		
5.2.4.	Range: Test bed to interceptor(s)		
5.2.5.	Test bed heading		
5.2.6.	Interceptor(s) heading(s).		
5.2.7.	Test bed speed		
5.2.8.	Interceptor(s) speed(s)		
5.2.9.	Test bed altitude		
5.2.10.	Interceptor(s) altitude(s)		

- 5.2.11. Aircraft identification
- 5.2.12. Voice recording of all communications on 1/4" magnetic tape.
- 5.2.13. Data printout (hard copy): It is required that hard copy data, specified in paragraph 5.2., be available by 0800 on the day following the test.
- 5.2.14. These provisions are required during all target detection tests.
- 5.3. Special ground instrumentation: During the flight test series, it may be advantageous or necessary to provide voice recording facilities at Lockheed, Edwards, or the vectoring facility.

## Interceptor Instrumentation

- 5.4.1. Recording of airborne radar: Information by means of photographic film or by magnetic media is desirable.
- 5.4.2. Time of Day All timing devices used on the interceptor should be synchronized with WWV prior to test activities.

  Radar data recordings shall include time of day information.
- 5.4.3. The F-104 interceptors shall be equipped with Sidewinder type captive missiles during all "snap up" intercepts.
- Documentation Interceptor pilots shall complete the ADC "controller/Interceptor Report" as accurately as possible. Particular attention shall be given as to the Time of Day and the Range to Target at which the afterburn was cut in.

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TYPE: NAB-2A

• • •

- 1. Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 35,000 ft.
- 1.2.2 Velocity: cruise
- 1.2.3 Engine mode: nonafterburning
- 1.2.4 Initiation of run: directly under test bed
- 1.2.5 Course: test bed course plus (+) 180 degrees
- 1.2.6 Termination of run: approximately 30 miles aft of test bed. Exact termination to be determined during run.

7. Now Many Runs

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30NM TERMINATE NO AB

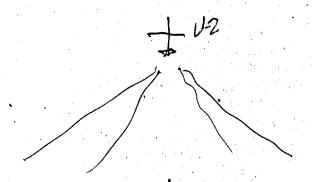
### TYPE: NAB-3A

- 1. Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 35,000 ft.
- 1.2.2 Velocity: / cruise
- 1.2.3 Engine mode: nonafterburning
- 1.2.4 Initiation of run: approximately 10 miles aft of test bed with 10 miles offset
- 1.2.5 Course: test bed course plus (+) or minus (-) 90 degrees
- 1.2.6 Termination of run: termination to be determined during test

Terminative test

TYPE: NAB-4A

- 1. Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 35,000 ft.
- 1.2.2 Velocity: cruise
- 1.2.3 Engine mode: nonafterburning
- 1.2.4 Initiation of run: approximately 30 miles aft of test bed
- 1.2.5 Course: test bed course plus (+) or minus (-) 15 through 35 degrees
- 1.2.6 Termination of run: may be terminated when interceptor is directly below test bed



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### TYPE: NAB-1B

1. Conditions: Same as for NAB-1A except paragraph 1.2.1 shall read:

"1.2.1 Altitude: approximately 30,000 ft"

### TYPE: NAB-2B

1. Conditions: Same as for NAB-2A except paragraph 1. 2. 1 shall read:

"1.2.1 Altitude: approximately 30,000 ft"

### TYPE: NAB-3B

1. Conditions: Same as for NAB-3A except paragraph 1.2.1 shall read:

"1. 2. 1 Altitude: /approximately 30,000 ft"

### TYPE: NAB-4B

1. Conditions: Same as for NAB-4A except paragraph 1.2.1 shall read:

"1.2.1 Altitude: approximately 30,000 ft"

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### TYPE: AB-1A

1.

- Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 40,000 ft.
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: at least 30 miles aft of test bed
- 1.2.5 Course: identical to and directly under that of test bed
- 1.2.6 Termination of run: terminate as interceptor passes under test bed

### TYPE: AB-2A

- 1. Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 40,000 ft.
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: directly under test bed
- 1.2.5 Course: test bed course plus (+) 180 degrees
- 1.2.6 Termination of run: to be determined during run

### TYPE: AB-3A

- 1. Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 40,000 ft.
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: approximately 10 miles aft of test bed with 15 mile offset
- 1.2.5 Course: test bed course plus (+) or minus (-) 90 degrees
- 1.2.6 Termination of run: termination to be determined during test

### TYPE: AB-4A

- 1. Conditions:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: approximately 40,000 ft.
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: approximately 30 miles aft of test bed
- 1.2.5 Course: test bed course plus (+) or minus (-) 15 through 35 degrees
- 122.6 Termination of run: may be terminated as interceptor passes beneath test bed

### TYPE: AB-1B

1. Conditions: Same as for AB-1A except paragraph 1.2.1 shall read:

"1.2.1 Altitude: approximately 50,000 ft"

### TYPE: AB-2B

1. Conditions: Same as for AB-2A except paragraph 1.2.1 shall read:

"1.2.1 Altitude: approximately 50,000 ft"

### TYPE: AB-3B

1. Conditions: Same as for AB-3A except paragraph 1.2.1 shall read:

"1.2.1 Altitude: approximately 50,000 ft"

### TYPE: AB-4B

1. Conditions: Same as for AB-ZA except paragraph 1.2.1 shall read:

"1.2.1 Altitude: approximately 50,000 ft"

### TYPE: AB-1C

1. Conditions: Same as for AB-1A except paragraph 1.2.1 shall read:

"1.2.1 Altitude: co-altitude with test bed (approximately 70,000 ft.)"

### And:

Paragraph 1.2.5 shall read:

"1.2.5 Course: identical to that of test bed"

### And:

Paragraph 1.2.6 shall read:

mipossible

"1.2.6 Termination of Run: as required by flight safety rules"

## TYPE: AB-5B

Conditions: same as for AB-1A except paragraph 1.2.1. shall read "1.2.1. Altitude: Approximately 50,000 feet"

Add paragraph 1.2.7.
Two (2) interceptors shall be used. The interceptors shall be separated (wing to wing) by 4 n.m.

## TYPE: INTERCEPT 1

- 1. Condition:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: commensurate for optimum attack in plus (+) or minus (-) 40 degrees aft sector of test bed
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: as required
- 1.2.5 Course: power climb in envelop described
- 1.2.6 Termination of run: as required

## TYPE: INTERCEPT 2

- 1. Condition: ,
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2: Velocity: as required
- 1.1.3 Course: straight and level with maximum evasive turn when interceptor is at approximately 15 miles
- 1.2 Interceptor
- 1.2.1 Altitude: commensurate for optimum attack in plus (+) or minus (-) 40 degree aft sector of test bed
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: as required
- 1.2.5 Course: power climb in envelope described
- 1.2.6 Termination or run: as required

## TYPE: INTERCEPT 3

- 1. Condition:
- 1.1 Test Bed
- 1.1.1 Altitude: approximately 70,000 ft.
- 1.1.2 Velocity: normal cruise
- 1.1.3 Course: straight and level
- 1.2 Interceptor
- 1.2.1 Altitude: "overshoot" to 73 to 75,000 ft. is required
- 1.2.2 Velocity: supersonic
- 1.2.3 Engine mode: afterburning
- 1.2.4 Initiation of run: as required
- 1.2:5 Course: power climb into plus (+) or minus (-) 40 degrees aft sector of test bed
- 1.2.6 Termination of run: as required

AB #C TYPE: INTERCEPT 4

1. Conditions: Same as for INTERCEPT 1 except two (2) interceptors shall be used. Lateral offset of four (4) miles is desirable.

III TUD sorties of TWO(2) F104's

#### APPENDIX A

## DETAILED REQUIREMENTS - BACKGROUND

Targets FUGHT PLANNING

During the course of the background flight test series, the following types of targets shall be covered as a minimal requirement:

- a. Metropolitan areas
- b. Steel mill(s)
- c. Power generation plants
- Refineries or chemical plants which utilize "high stacks" for burn off of gases
- e. Mountainous areas having high, sharp peaks. If the time of year is appropriate, coverage of peaks having snow or ice covering is desirable.
- f. Relatively high altitude areas of water such as mountain lakes
- g. "Bright" desert areas, both high and low altitude
- h. Areas of extended vegetation, such as forests
- i. Areas having high boundary condition (distinct) contrast; i.e., water/ vegetation, coast line/shore, contour or irrigation farms, etc.
- j. Extended water areas the ocean

- k. Direct view of the sun by the system sensor
- 1. Specular solar target into the sensor's field of view. This will require the test bed to be positioned over the ocean when the sun's rays will reflect at an angle of less than thirty (30) degrees.
- m. Areas having high concentrations of commercial jet traffic. Both "in route" traffic as well as traffic in landing and take off operations is desirable. (Types of aircraft should be noted if possible).
- n. Target of opportunity areas which could provide bomber or other large military aircraft targets.
  (Types of aircraft should be noted if possible).
- o. Areas containing extended cloud formations. (Daily liaison with the cognizant meteorological office is required).
- p. Areas containing high altitude cumulus cloud formations. (Daily liaison with the cognizant meteorological office is required).
- q. Other high radiance or reflective man made targets
- r. Other high radiance or reflective natural targets.
- s. Intercept of the above targets at different hours of the day is desirable.

### APPENDIX B

DETAILED REQUIREMENTS - TARGET

TYPE: NAB-1A

1. Conditions:

1.1 Test Bed

1.1.1 Altitude: approximately 70,000 ft.

1.1.2 Velocity: normal cruise

1.1.3 Course: straight and level

1.2 Interceptor:

1.2.1 Altitude: approximately 35,000 ft.

1.2.2 Velocity cruise

1.2.3 Engine mode: nonafterburning

1.2.4 Initiation of run: approximately 30 miles aft of test bed

1.2.5 Course: identical to, and directly under that of the test bed

1.2.6 Termination of run: may be terminated when interceptor is directly under test bed

Will request great deal of 30 Not time for this pass (20 min)

1 WIERCEPTER-NO AB

### Test Bed

The test bed shall be operated at normal cruise altitude Pilot Part: and velocity. A mission duration of approximately four (4) hours

The pilot shall cover the target areas as designated in the daily flight test plan. During the course of the test, it is necessary for the pilot to determine his position at intervals of approximately every fifteen (15) minutes as well as to record the time of day he is over designated target areas.

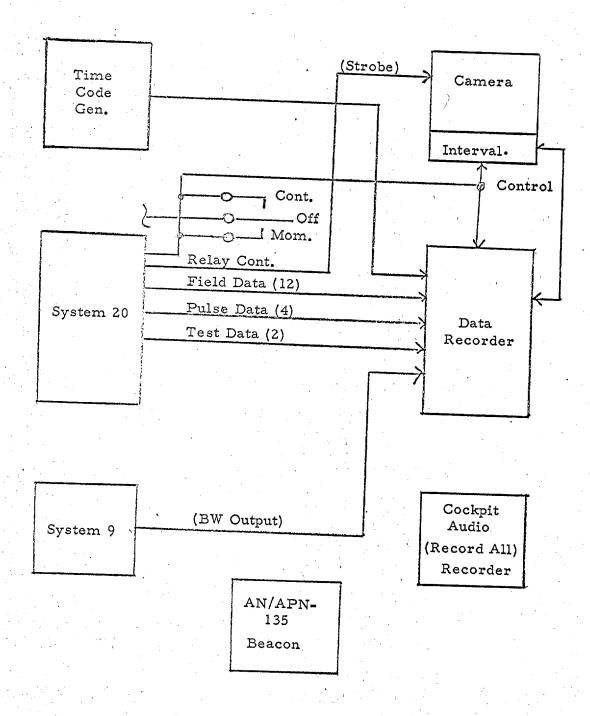
When the test bed has attained cruise altitude, the pilot shall initiate the System 20 self-test to reconfirm its operational status. Self-test should be initiated at intervals of approximately every thirty (30) minutes during the test; but in no event shall he initiate the self-test function while over a designated target area. Self-test shall also be initiated upon completion of the test sequence but prior to descent from cruise altitude.

If targets of opportunity appear during the mission, the pilot should note their characteristics, location, and the time at which they were acquired.

The test bed pilot shall be made aware of the provisions of Appendix E, Security.

### APPENDIX C

# TEST BED INSTRUMENTATION BLOCK DIAGRAM



### APPENDIX D

### DETAILED TECHNICAL INFORMATION

### TEST BED INSTRUMENTATION

1. Interface connector J101 (PTO2A-18-30), located on pod.

Pin	Function	Rating (Max)
A	+28V (Aircraft)	2 amp. av.; 8 amp. surge
В	Self-Test Indicator (Go)	0.1 amp
C	Common Amplifier	(10ms pulse)
D	Tone Generator Switch (Alt)	28V to Tone Generator; 280 milliamperes
E	Field Indicator #12	0.1 amp.
F	Field Indicator #11	0.1 amp.
Ġ	Field Indicator #10	0.1 amp.
H	Field Indicator #7	0.1 amp.
J	Field Indicator #8	0.1 amp.
K	Field Indicator #9	0.1 amp.
L	Field Indicato #5	0.1 amp.
M	Field Indicator #4	0.1 amp.
N	Scan Bar #1 (Test Point)	5V Bar 1; max loading ≥500 K ohm
P	Field Indicator #6	0.1 amp.
R	Field Indicator #2	0.1 amp.

S	•		Field Indicator #3	0.1 amp.
T			Contact Closure	N.O. relay pair; closure on target indication; current rating 0.5 amp.
v			Contact Closure	N.O. relay pair; closure on target indication; current rating \$0.5 amp. resistive
X			Tone Generator Output	5V peak into 110.0 load
Y		:	Trigger Output (Test Point)	*
Z			Field Indicator #1	0.1 amp. (60 ms)
<u>a</u>		• . • .	Up Limit Indication (Test Point)	24V Up Limit; max loading≥500 K ohms
<u>b</u>			Power On Switch (alt)	+28V to Control Relay; 250 ma
<u>c</u>			400 Hz Input	1.5 amp. (shielded wire)
<u>d</u>	•		Self-test Switch (mom.)	+28V to control relay
<u>e</u>			Ground	Approx. 3.5 amp. av. & 8 amp. surge during caging or self-test.
<u>f</u>			Self-test Indicator (in progress)	0.1 amp.

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Spare

NOTE: \* Target indication after size discrimination but prior to verification logic; 24V target; max. load ≥ 500 K ohm; pulse width 10 ms.

2. The following tabulation identifies those functions which shall be recorded for test documentation purposes:

Field Indicator # 1
Field Indicator # 2
Field Indicator # 3
Field Indicator # 4
Field Indicator # 5
Field Indicator # 6
Field Indicator # 7
Field Indicator # 8
Field Indicator # 9
Field Indicator # 9
Field Indicator # 10
Field Indicator # 11
Field Indicator # 12

Self-Test Indicator (GO)

Self-Test Switch

Common Amplifier

Scan Bar #1

Contact Closure (T, U)

Trigger Output

Up Limit Indication

Time Code Generator

Intervalometer

System 9 (BW Contact Closure)

### APPENDIX E

#### SECURITY

Due to the continued presence of foreign vessels, equipped with electronic intercept equipment, along the coastal areas over which the described flight tests will be conducted, it is recommended that the following measures be implemented as well as other measures which may be required by the cognizant security offices:

- a. Furnish information concerning the location of known or potential intercept vessels to the test conductor, the cognizant operations officers, and the cognizant security officers. This information shall be made available to the above personnel at least three (3) days prior to the initiation of the test series and shall be reconfirmed or modified on a daily basis throughout the test series.
- b. Prearranged, coded radio transmissions which describe system activity and other critical parameters shall be used in lieu\_of-"plain language" voice transmissions to the maximum extent which is practical.

APPENDIX F

### FLIGHT TEST SCHEDULE

3 flights in now ?

D	a.	+	e
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11 October 1967

12 October 1967-

12 October 1967

- 13 October 1967

16 October 1967

18 October 1967

19 October 1967

23 October 1967 APC motor must

24 October 1967

25 October 1967 ADC

26 October 1967

27 October 1967 A DC

28 October 1967

### Activity

Smoke Test

Background Tests

Quick look data reduction

Background tests

Quick look data reduction

Background tests - backup

Quick look data reduction backup

Target detection tests, medium altitude interceptors

Quick look data reduction

Target detection tests, medium to high altitude interceptors

Quick look data reduction

Target detection tests, high altitude intercepts

Quick look data reduction

PRELIM

## Approved For Release 1999/09/07: CIA-RDP71B00263R000200320025-6

300) 31 October 1967 Not on smally if forther Target determined altitude high altitude 2 31 October 1967

high altitude intercepts

Quick look data reduction

Test series complete

	APPENDIX G
	SORTIE ESTIMATE  SORTIE ESTIMATE  Lev surture  Lev surture  10/2
	F-ya Aircrafts 1010
Intercept Type	F-101 F-104 F-106
AB-1A AB-2A AB-3A	F   1
AB-1B AB-2B AB-3B AB-5B	3 3 3 3 3 3 2 2 2 2 4 2 2 4 2 2 4
Intercept 1 2 Intercept 3 2 Intercept 4	3 6 6 2 XY
AB-1C	2
	15 24 18 Stolut